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PUBLIC WORKS

CITY COUNTY STATE

EXCAVATING HARD CLAY IN HEADING WITH PNEUMATIC COAL PICKS WITHOUT THE USE OF EXPLOSIONS
MILWAUKEE WATER WORKS TUNNEL

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Selecting, Installing and Operating Concrete Mixers

NOVEMBER 26, 1921

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PUBLIC WORKS.

CITY COUNTY STATE

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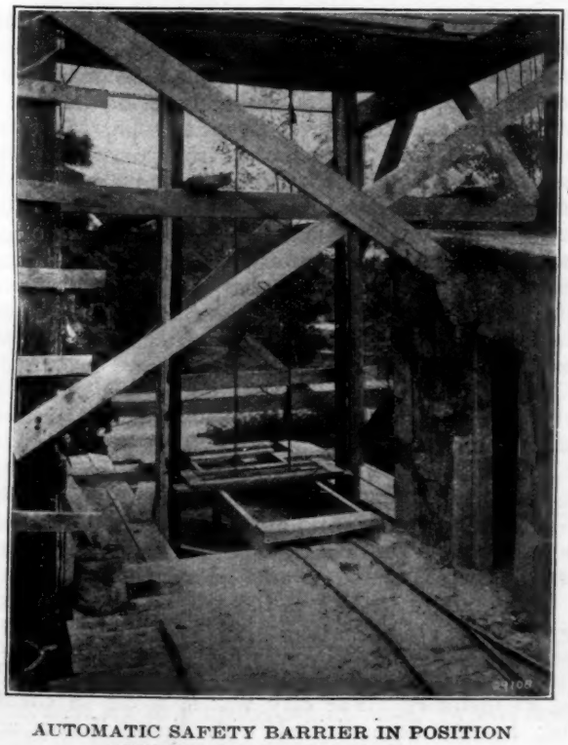
Vol. 51 NOVEMBER 26, 1921 No. 22

Linwood Avenue Tunnel, Milwaukee Water Works

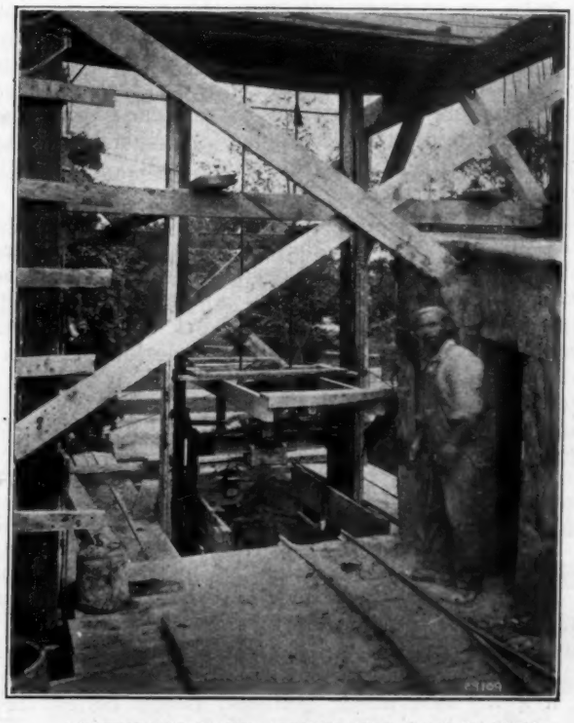
Waterworks tunnel 7,464 feet long and 9 feet in diameter, driven from two shafts alternately, through clay, under 27 pounds pressure, without shield. Shaft linings partly sunk and partly underpinned. Hard clay excavated with pneumatic tools.

A supplementary water supply for the city of Milwaukee is to be drawn from Lake Michigan through an intake crib located in water 67 feet deep and 6,500 feet from the shore line and through a tunnel, one section of which, now under construction, extends from a shore shaft 7,085 feet across the Lake Park and under the center line of Linwood avenue, in the fine residential part of the city, through the Lake Drive and Oakland Construction shafts and under the Chicago and Northwestern Railway, the Milwaukee river and a 5-foot intersecting sewer to a gate well outside the location for the proposed Riverside pumping station.

This section of the tunnel is on a tangent and is uniformly graded down from the lake and to the gate well, descending 12 feet in 7,000 feet. The nine test borings made on the center line in advance of the construction work indicated that the tunnel would



AUTOMATIC SAFETY BARRIER IN POSITION PROTECTING OPEN SHAFT



ASCENDING CAGE AUTOMATICALLY RAISES SAFETY BARRIER

pass from the lake to the pumping station through gray and sandy clay with boulders, hardpan, sandy hardpan, and blue clay, and the materials that had been encountered on November 1st when the excavation was 99.3 percent completed was characterized as chiefly "hard stony clay with pockets and strata of water bearing sand, quicksand and gravel in wavy strata, substantially horizontal. The clay was found to be frequently stratified with alternating seams ½ inch to 3 inches thick, filled with water-bearing sand and having occasional pockets of sand and gravel, but no pockets of harmful gases, which are sometimes found in clay strata."

EXCAVATING SHAFTS

Besides an 11 x 11-foot and a 5 x 7-foot gate well, there are two permanent construction shafts 10 feet in diameter inside, one of them at Lake Drive, 1,341 feet from the lake end of the tunnel, from which headings have been driven in both directions to a combined length of 3,475 feet, and the other at Oakland avenue about 1,550 feet from the proposed pumping station, from which headings will have been driven in both directions to a combined length of about 3,989 feet.

Both shafts were excavated square, braced by 10- x 10-inch timber sets spaced 4 feet center to center, with 2-inch maple sheathing at the outside of the excavation. The cross-section of the excava- was 18 x 18 feet, offset at a depth of 16 feet to a cross section of 16 x 16 feet. The Oakland avenue shaft was excavated by this method to a depth of 33 feet and the Lake Drive shaft to a depth of 58 feet. At these depths, concrete caissons were built 10 feet inside diameter with a 12-inch shell in 12-foot sections to a height of 36 feet.

At the bottom of each caisson a steel cutting edge was placed, made up of a 6- x 6-inch angle iron to which was rivited a 7/16-inch steel plate fixed to the outside of the concrete shell to a height of 6 feet. The earth excavated inside the concrete lining with air hammers allowing the caisson to sink by its own weight. The Oakland avenue shaft was sunk through 14 feet of red clay, 7 feet of blue clay, 15 feet of sandy gray clay, 54 feet of hard stony gray clay and 10 feet of sand and gravel to a total depth of 100 feet below the surface of the ground or 30 feet below the water level, corresponding with the surface of the lake.

The spoil was excavated by hand, using bars, picks and shovels and the hard clay was loosened and detached without explosives, by Ingersoll-Rand pneumatic "coalpicks" with 8-inch octagon bits about 1 inch in diameter. The work was done with three 4-man shifts per day, each working 8 hours and making a progress of about 3 feet in 24 hours. They removed the bottom in lifts of 4 to 6 feet and maintaining a sump 3 feet deep, from which the water was readily drained by a Nye pump.

UNDERPINNING SHAFT LINING

When the shaft entered the gravel stratum about 63 feet below the ground, the sinking of the concrete lining was stopped by the increasing friction on the exterior surface, and the excavation was continued 10 feet to the underlying hardpan inside with four successive courses of 2 x 6-inch sheeting boards about 30 inches long with their abutting ends bearing on a 4- x 1-inch inside sectional flange bolted steel ring. The sheeting was placed in successive annular trenches dug around the circumference of the shaft in 30-inch lifts that were sheeted as fast as circumferentially extended. The first course of sheeting took bearing at the upper end on the cutting edge of the concrete lining and at the lower end on the steel ring, which also received the top of the next course. Vertical anchor rods were imbedded in the bottom of the 40-foot upper section of the concrete lining, with rings turned on their lower end and projecting below the cutting edge, thus forming connections for hooked vertical rods, with rings on their lower ends, which were built into the concrete lining that was placed against the sheeting boards in 5-foot courses that, after setting were suspended from the fixed lining above while excavation was continued below their lower edges.

After the annular trenches were excavated and sheeted, the core in the center of the shaft was removed, another lift was taken out of the bottom, and so on until the excavation was carried through the gravel to the hardpan, where it was continued and the construction of the successive 6-foot underpinning rings of the lining was carried on the same as the above described, except that the vertical sheeting, being unnecessary because the hardpan would stand without sliding, was omitted. The Lake Drive shaft was 120 feet deep and was excavated and lined in the same manner as the Oakland avenue shaft, except that in this case no sheeting was required, and the lining was built by the suspended courses 6 feet high for the lower 80 feet of the shaft. The Lake Drive shaft was driven through 58 feet of stiff red clay, 12 feet of sandy red clay, 10 feet of stony blue clay and 40 feet of hard stony red clay.

The Lake Shore gate well, 44 feet deep, was excavated through red clay for its entire depth; both of the gate wells were excavated and lined in the same manner as the Lake Drive shaft.

TUNNELING PLANT.

Tunneling operations were commenced from the Oakland avenue shaft, where, at the surface of the ground, a shaft house and power plant were installed and were equipped with four Ingersoll-Rand air compressors of the Imperial type, having capacities of 1,000 feet, and 1,200 feet of free air per minute compressed to a pressure of from 12 to 31 pounds and of 850 cubic feet per minute compressed to 100 pounds or more, all of them driven by electric motors. The shaft elevator cage was operated by a Thomas electric hoist and there were two Jeansville centrifugal pumps of 6-inch and 5-inch diameter and two steam driven Cameron plunger pumps, one of them used for grouting.

The concrete for the tunnel lining was mixed in a Koehring ½-yard machine, installed 10 feet below the surface of the ground so as to be fed by gravity from the aggregate and cement storage on the surface, and discharging through a chute to the ½-yard side dump cars in the tunnel which were operated on a 14-inch guage track and handled both concrete and muck.

TUNNEL EXCAVATION.

The tunnel was excavated with a full width top heading having a semi-circular cross section, 11½ feet in diameter. The clay was split off in chunks after having been drilled with three Kellar and

small Ingersoll-Rand pneumatic "coal picks" making inclined holes close together and operated by three miners in each 8-hour shift. As fast as the extrados of the heading was excavated down to a level 1 foot below the spring line of the arch, the roof and sides were supported with continuous arch timbering consisting of bents made with five arch segments, each composed of two 3- x 6-inch planks, fastened together with cleats on the inner surface at each end. These were set up on 4- x 6-inch longitudinal bottom sills and when necessary were tightly adjusted in position by wooden wedges driven home between the cleats at the ends of the segments. A permanent lining 3 inches thick was thus formed outside of the concrete work and protected the miners from roof falls, which, however, seldom threatened.

On a few occasions where the ground was very bad, a small amount of gravel up to 1 or 2 yards fell from the roof, but loose places were generally supported by the timbering in time to prevent any fall. When sand and gravel pockets were encountered, the surface was packed with hay that served as a strainer, holding back the solid matter and permitting the water to seep freely through to the tunnel, where it was collected in the drains to the sumps.

As fast as the spoil was excavated it was shovelled by three muckers into the dump cars which were drawn to the foot of the shaft by two mules. The cars were run on a single-track service line, laid on the platform that floored the finished tunnel lining 18 inches above the lowest part of the invert. Besides the muckers and miners there were two skinners, one lock tender and one foreman, making a total force of ten men in each of the three 8-hour shifts daily.

The dump cars were hauled to the air locks at the foot of the shaft and there hoisted on the platform of the elevator cage, and transferred to a surface track running to the spoil bank. In order to prevent the possibility of cars on the spoil track being accidently pushed into the shaft when the cage was below the surface, the top of the shaft was protected by a moveable horizontal framework supported on the surface of the ground alongside the shaft, and having longitudinal timbers connected by transverse pieces providing a stop for the cars on the surface track. A pair of transverse timbers across the top of the longitudinal pieces at the center point served as guides engaging the vertical timbers of the framing and had clearance between them that permitted the hoisting ropes to operate but would not clear the sheave on the top of the cage over which the hoist rope passed; therefore the framework formed an automatic safety device that, when the cage was lowered, rested on the surface of the ground. When the cage rose to ground level, the sheave frame engaged the transverse guide strips and carried the framework to the top of the hoist while the top of the shaft was closed by the cage and the cars were rolled on or off the platform. The descending cage deposited the safety framework in position on the ground as soon as the cage itself ceased to protect the shaft.

The heading was excavated at the rate of from 8 to 12 linear feet daily according to the condition of the ground encountered; and the bench or "box," in sections up to a maximum of about 15 feet long, was excavated in the same manner as the face of the heading except that the holes drilled in it were in substantially vertically planes. The total amount of excavation averaged about two yards per linear foot of tunnel. The concrete in the lining averaged about one yard per linear foot and the work was executed by the contractor, H. Hohensee, at an average rate of about 6 linear feet daily in each heading. The unit price was $66.97 per linear foot of completed tunnel.

CONCRETING

The excavation for the invert was cut carefully and smoothly to coincide with the required exterior surface of the cylindrical lining up to one foot below the spring line. Pyramidal concrete blocks about 12 inches high and 6 inches thick at the top were set about 4 feet apart on the center line of the tunnel floor and intermediately supported the 2- x 6-inch lagging strips 12 feet long that were carried at the rear end on the finished concrete invert and at the forward end on a wooden transverse profile board forming a bulkhead to retain the concrete. The center strip of the invert concrete about 2 feet wide was then laid between the finished invert and the bulkhead, enclosing the pyramidal blocks. Immediately following this there were set on it vertical transverse circular ribs of 3- x 3-inch angle iron made in halves spliced with fish plates, at the spring line, and spaced 4 feet apart on centers. These ribs were braced together by four approximately equidistant lines of wooden longitudinal struts bolted to them.

The 2- x 6-inch wooden lagging strips were placed from the bottom up, symmetrically on both sides of the center as fast as the concrete was filled in over the upper bar on each side, and thoroughly tamped and rolled to position. As soon as the concrete was brought up to the spring line, horizontal cross pieces were bolted to the ribs to support the floor, which was laid through the forms, carrying the service tracks on which the concrete was delivered. The concrete was shoveled by hand over the side wall and arch lagging bolted to the outer flanges of the ribs, until the lining was completed up to the crown, where a space about 10 inches wide on each side of the center line was left by the omission of the lagging and was covered by curved 24- x 24-inch plates, 1/8 inch thick, supporting the dry concrete in the key of the arch which was thoroughly rammed to position, thus finishing the arch. The concreting operations were conducted alternately with the mining and mucking, as the concreting interfered with the operation of the mucking cars.

TESTING FOR GAS

Precautions were taken to detect the presence of gas that may escape from pockets and fissures in the clay and collect in the tunnel. As this gas is colorless and tasteless, its presence is not obvious and if it occurred would be dangerous on account of its explosive character when mixed with certain proportions of atmospheric air conditions that have caused fatal explosions in other tunnels, notably in the Cleveland waterworks tunnel, driven through a clay stratum.

Samples of tunnel air are collected daily in one-gallon bottles, brought into the tunnels filled with water, and emptied near the tunnel invert at the headings, where they become immediately filled with air

or any gas that may prevail there and are hermetically sealed. They are carried to the laboratory and their contents are immediately tested by the Orsat method, which consists in passing the sample air first through potash to remove the carbon dioxide, after which it is carefully measured for volume and passed through phosphorus to burn out the oxygen; measuring it again shows whether there had been too little oxygen and if this is the case it follows that the deficiency in oxygen must have been made up by some other gas which is determined by a second analysis, eventually showing whether the air contains any dangerous amounts of injurious gas. So far this has not been the case and the 20.1 to 20.5 percent of oxygen that it contains indicates the presence of not more than 5/10 of one percent of carbon dioxide, the dangerous element that is sought for.

GROUTING

In order to fill the cavities that may exist around the sheeting or close to the tunnel in the stratum through which the excavation is made, the exterior of the concrete lining is thoroughly grouted with neat cement grout to the amount of about 1½ barrels of cement per linear foot of the tunnel. As it has been found by experiments and observation that grout travels from 300 to 400 feet along to the exterior surface of the lining, the grout is ejected at 110 pounds pressure through 2½ inch pipes about 100 or 200 feet apart in the crown of the tunnel, thus requiring the grout to travel not more than ¼ of the possible distance in order to reach the full length of the tunnel construction.

This distribution of the grout is believed to be limited to a maximum width of 10 or 15 feet each side of the tunnel center where the original strata has been disturbed and thus involves little loss of grout by its penetration to places where it is not needed, remote from the tunnel alignment. The grouting operations are carried out only at intervals of several weeks according to the progress that has been made in the tunnel construction. The amount of grout ejected through the grout holes is governed entirely by the capacity of the pump, which is operated until it stops through resistance equalling its pressure.

A very smooth and uniform finish is given to the interior of the tunnel by a 1/16-inch coat of plaster made of one part cement and two parts sand, and applied with a trowel within 24 hours after the forms are stripped.

AIR LOCK

The pneumatic pressure is maintained in the tunnel by means of an air lock 21 feet long, (capacity of 3 cars) located near the foot of the shaft and formed by two vertical transverse 16-sided steel plate diaphragms ½ inch thick projecting half way through the 12-inch thickness of the concrete lining. Each diaphragm has a 5- x 5-foot concentric retangular opening with the horizontal lower edge 18 inches above the center of the invert. The edges of the opening are reinforced by angles and plates and the opening itself is closed by a ½-inch thick steel plate door reinforced around all the edges by a 3-inch riveted strip planed to one inch in thickness and grooved to receive the rubber gasket. The door is provided in the upper part with a 6-inch bulls eye, and is reinforced by three 6-inch horizontal I-beams at approximately equidistant spacing. The gasket ½ inch thick and 2 inches wide is T-shaped in cross section with the stem dovetailed into groove. The door hinges have cylindrical pins in slotted holes allowing abundant play to insure the door to be pressed firmly against the gaskets by the air pressure. The total weight of one bulkhead and door is about 2,900 pounds.

Most of the gravel was located in the roof of the excavation and extended down in the face as low as the spring line of the tunnel. When mining through this, the compressed air passed out very freely and cropped out at the surface as far as 1,000 feet from the heading. In order to confine the air to dry up the ground, plastic clay was spread over the unlined section. Grouting outside of the concrete lining, as previously described, and mudding up, cut down the loss of compressed air and made it possible to keep the tunnel dry with the number of air compressors used.

The ground in Milwaukee is very irregular and in an advance of 10 feet of a tunnel, there may be a complete change of stratification. Due to this condition, the Linwood avenue tunnel was driven under air pressure, thereby making condition of operations safer and assuring a tunnel built in the dry.

The work was designed and executed by the City of Milwaukee, George F. Staal, city engineer and Arthur H. Raelzman, resident engineer.

Funds for Municipal Work

Information was sent out under date of November 8th by the President's Conference on Unemployment giving some figures obtained from the 13 states of Illinois, Connecticut, New Hampshire, Michigan, Wisconsin, Ohio, Rhode Island, Pennsylvania, New York, Minnesota, New Jersey, Massachusetts and Indiana. In these states more than $60,000,000 in city bonds have been sold recently and $34,000,000 in addition have been offered for sale.

The largest state bond sale was that of $5,000,000 for highways in Illinois, while Michigan had sold for highways $3,000,000 of a $4,000,000 offering. The rate of the state bonds was 4 percent for Illinois, 5 percent for Connecticut, 5.5 percent for the soldiers' bonus of Michigan, and 5.75 percent for Michigan highway bonds. The city bonds ranged from 4 percent in Chicago to 7 percent in Hibbing, Minn., but the majority were 6 percent bonds. The greater part of these bonds were for erecting or extending highways, schools, sewers, filtration plants, water works, hospitals, parks, forest preserves, bridges, lights, paving, court houses, fire department and police department equipment, streets, sidewalks, beach improvements and memorial playgrounds.

Col. Arthur Woods is quoted as saying: "All of this work will undoubtedly go forward within a few months. If, by any encouragement we can give, any of this work can be put under contract even a few days earlier than otherwise, the unemployment period will have been diminished to that extent and to that degree."

As to federal appropriations, in addition to the federal aid road bill, the Smith bill is being speeded up by the house committee for the irrigation of arid lands, this bill appropriating $20,000,000 for the immediate prosecution of reclamation projects already begun.

Indianapolis Water Company Completes Reservoir

On Tuesday, November 15th, the Indianapolis Water Co. entertained a number of representative citizens of that city at its Riverside pumping station in order to give them an opportunity to inspect the 10,000,000-gallon clear-water reservoir which is practically completed and also the pumping station property. This reservoir is 564 feet 6 inches long and 258 feet wide, with a concrete roof covering an area of 3¼ acres. The depth of the reservoir from the low point in the floor to the roof is 10 feet 8½ inches. In its construction there were involved 52,175 cubic yards of excavation, 25,000 cubic yards of embankment, 11,160 cubic yards of concrete, 468 tons of steel reinforcing bars and 60,000 brick for the baffle walls.

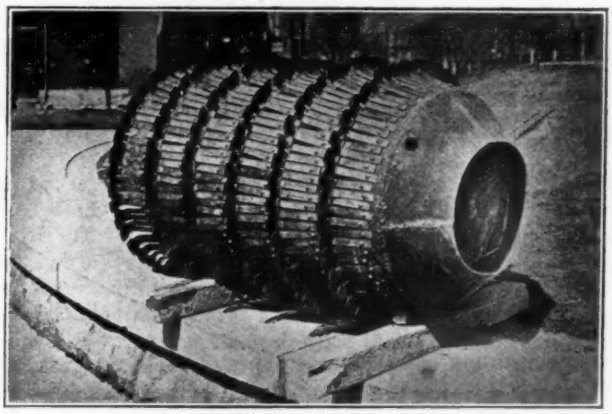
Cleaning St. Louis Water Mains

New machines designed for cleaning 30-inch and 36-inch mains, and experience with experimental machines

An ordinance passed in the city of St. Louis in 1920 provided for cleaning 250,000 feet of water main and a contract was let that year to the National Water Main Cleaning Co., the only bidders, for cleaning 12 and 20-inch mains at 28 cents a foot and 30 and 36 inch mains at 35 cents a foot.

The cleaning of the larger mains was considered to be something of an experiment. All but one of the large cleaning machines so far designed had been of the "pontoon" type. The central air chamber, which also serves as a rigid axis for the cutter heads, gives the machine enough buoyancy when in the water to prevent the over-cleaning of the pipe bottom to the deteriment of the top of the pipe. A 30-inch machine of a different type was designed and tried but found to be basically defective. A 35-inch machine of improved design was used which had five heads each containing 80 blades. The first and last sections were welded to the pontoon, while the middle three were hung loose and held in place by chains, the theory being that the machine would round corners more readily with loose sections than if all the heads were attached rigidly to the air chamber. These loose heads proved to be not only unnecessary, since the greatest degree of curviture in commonly used 36-inch castings is 15 degrees or a 1/24th bend, but in work on Grand Avenue they were positively detrimental. The Grand Avenue 36-inch low pressure main had been in continuous service for 50 years. The machine was inserted with the intention of cleaning the entire 18,446 feet at one shot. When the water was turned on behind the machine it progressed satisfactorily at a speed of about 85 feet per minute until the first 36 x 36 three-way was encountered. At this point the front head got into the three-way opening and the machine swerved off line sufficiently to jam, since it was held to its course by the rear head only. After several days' work spent in removing the dome from a nearby valve, the main was entered, the head lined up, and pulled past the three-way opening with jacks, and the shot completed. The rest of this line was cleaned without difficulty, but following this the machine was scrapped and last winter was spent in designing a new cleaning machine.

Late in March of 1921 a new 36-inch machine was delivered and put into use. This new cleaner contains six heads of 80 blades each, the first three being sawtooth and the rear three plain scrapers, all rigidly attached to the central air chamber. The free diameter of all the heads is 38 inches from tip to tip of blades. The volume of this air chamber was made smaller than in the other scrapers to avoid cleaning the top of the pipe more thoroughly than the bottom, which had been the effect of the other scraper on three blocks of Grand Avenue personally inspected by Leland Chivvis, engineer in charge of the distribution section.



SECOND 36-INCH CLEANING MACHINE

The new machine did good service, a test made on the section cleaned showing that the capacity of the main had increased to 98 percent of that of a new main, although before cleaning its capacity had been only 67 percent.

Highway Building in New Jersey

The state of New Jersey's highway commission has pledged for road work, mostly in the form of aid to counties, all of its revenue of 1922, which it expects to obtain, under the Edge Road Tax Act, and road building may end with the completion of the present contracts unless some plan of financing is devised Governor Edwards has recently suggested to the highway commission that the several counties be asked to go ahead with the construction of those sections of the state highway system which lie within their respective boundaries, with the understanding that the state will reimburse them in the years 1924 to 1926 from the funds which are expected to be then available.

With a view to carrying out this suggestion, the highway commission is to hold meetings during November in different parts of the state to discuss the proposition with the counties, the counties being divided into geographical groups for discussion of the matter with the commission.

Refuse Disposal in Chicago

Garbage collection and delivery cost $7 a ton. The reduction plant was operated last year by the city at a loss of nearly half a million dollars.

The report of the Department of Public Works of Chicago for the year 1920, which has just been received, gives the following information concerning municipal garbage collection and disposal in that city.

Of garbage, as distinguished from ashes and rubbish, there were collected 78,701 tons by the Bureau of Streets and 1,692 tons by private scavengers. All of the municipal collection and 1,123 tons of the private collection were delivered at loading stations, from which they were taken by boat to the municipal reduction plant, except for a comparatively small amount taken to the plant by direct haul by teams. The collection and delivery of the garbage cost the city $551,332 for the year, or $7 per ton, or 20 cents per capita.

The total amount of garbage received at the reduction plant, 80,132 tons, was 2,684 tons less than in 1919. From this garbage there was produced by reduction 2,208,620 pounds of garbage grease and 11,415 tons of garbage tankage. Of the garbage grease, 1,660,620 pounds were sold at an average price of 5.14 cents per pound, or a total of $95,310. The amount of garbage tankage produced was 11,415.4 tons, of which 11,170.4 tons was sold for $81,421. In addition to these, the animal grease, rags, bones and hides from the garbage and miscellaneous scrap were sold for a total of $14,016.

In addition to this total of $190,747 received from sales, the inventory at the end of the year showed an increase over that at the beginning of $50,726, giving a net revenue for the year of $241,474. The operation expense of the plant was $695,248. This shows a net loss in operation of the plant of $453,774. This large loss was attributed to an increase in the cost of labor and supplies and a decline in price received for the products of reduction. The cost is probably greater than in most cities, and certainly than in most privately operated reduction plants, because the Chicago plant is operated in as sanitary a manner as possible. "No complaints have been registered during the year by residents or enterprises in the locality as to offensive odors. The many visitors during the summer months, when garbage is most offensive and when the plant is taxed to its capacity, have been unanimous in expressing surprise at the inoffensive manner in which the garbage is handled and the absence of obnoxious odors."

During the year $41,162 was spent for construction and rehabilitation work at the plant, of which about 65 percent was paid from the waste disposal building and equipment bond fund, and most of the remainder from the corporate fund.

The cost of operation per ton of raw garbage is itemized as follows: salaries and wages, $5.099; fuel oil, $1.452; power and light, $0.165; coal, $0.061; supplies and repairs, $1,359; total, $8.676. The similar items for 1919 were approximately the same except for coal, which was $0.455, fuel oil which was $0.805, and salaries and wages which total $3.819; giving a total cost for 1919 of $6.625.

The prices received for garbage grease varied from 5.5 cents to 6 cents per pound, animal grease from 5.25 cents to 7 cents, hides 26.23 cents, garbage tankage from $7 to $12 per ton, garbage bones from $20 to $22, and garbage rags and scrap metal $9 per ton.

The monthly receipts of garbage varied from a minimum of 4,412 in February to a maximum of 10,438 in September. In 1919 the minimum had been in December, with 4,436 tons, and the maximum in August with 9,820 tons. The monthly production of garbage grease varied from a minimum of 62,500 pounds in October to a maximum of 288,520 pounds in May. The difference in the quality of the May garbage and the October garbage is indicated by these figures, which show the garbage grease produced per ton of garbage in May to have been 57 pounds per ton while in October it was 6.3 pounds per ton; the average for the year having been 27.6 pounds. Of tankage, the May garbage produced 0.21 ton, the October garbage 0.084 ton, while the average for the year was 0.142 ton.

Street Cleaning in Chicago

During the year 1920 the Department of Public Works of Chicago cleaned 2,538,483,925 square yards of streets by hand by the block and gang system, removing in the operation 417,146 cubic yards of dirt at a cost of $1,688,739, or 66.2 cents per thousand square yards or 61 cents per capita.

By the use of auto sweepers the department cleaned 49,103,038 square yards of street at a cost of $10,916, or 22 cents per thousand square yards. Auto flushers were used for cleaning 82,074,096 square yards of streets in the first ward (in which process there were used 19,092,790 gallons of water) at a cost of $12,642, or 15 cents per thousand square yards.

Catch basins were cleaned partly by hand and partly by auto educator machines. Hand cleaning was used for 15,006 catch basins at a cost of $62,014 or $4.13 per catch basin; while 28,052 catch basins were cleaned by machine at a cost of $63,102 or $2.24 per catch basin.

Refuse Disposal in Dallas

Dallas, Texas, with a population of about 185,000, produces 300 tons of rubbish per day by actual weight, which is collected without separation and hauled to a dump. The engineering department of the city, which has charge of the collection, prepared plans for incineration of the rubbish. These plans divide the city into four districts and place an incinerator in each district, in this way cutting the transportation cost to the minimum. The incinerators are designed large enough to burn all the collected material in from eight to twelve hours, thus eliminating all need of storage space, storage of garbage being always objectionable and unsanitary.

The amount of refuse collected in Dallas at present is stated by the city engineer, George D. Fairtrace,

to average 1200 cubic yards a day, 1060 cubic yards of which is collected between the hours of 8 a. m. and 5 p. m., while 140 cubic yards is collected between the hours of 10 p. m. and 7 a. m. All the refuse has been weighed for the past 18 months and has averaged 500 pounds per cubic yard.

The collection is made in steel side-dump wagons or trailers by teams. The routing and other details are so planned that five trailers meet at one point, so located as to necessitate little additional haul after they have been filled, and at this point the tongue is unsnapped and he trailers are all hooked in a train behind a converted Ford tractor. This tractor has been hauling them to the dump, but when the four incinerators are in operation the trailers will be hauled to them.

Bids were received in September for the four incinerators and a contract was awarded for the construction of what is known as the Stokes type, several of which have been built in Texas, including four at Houston. One of the four Dallas plants will have a capacity of 80 tons in 12 hours and the other three a capacity of 40 tons in 12 hours. They are so located that the average haul on the refuse collected will be a little less than one mile, instead of the present average haul of 2½ miles to the dump.

It is the intention to operate the plants at present only 8 hours a day. There will therefore be room for taking care of increasing amounts of refuse by merely extending the length of time of operation per day. It was thought desirable not to figure on a 24-hour capacity because this would have required storage of sufficient refuse from the day collections to have continued the operation of the incinerator through the night, which would mean a storage capacity of two-thirds of the daily collection.

Mr. Fairtrace informs us that he is going to install at each incinerator a set of scales of the type known as motor truck, which will have a capacity of 10 tons and will be used for weighing all of the refuse that is burned in the city.

Sewage and Fish

Among the arguments for requiring cities to purify their sewage before discharging it into streams, the danger to the fishing industry is frequently referred to, but it is seldom that actual figures are given, nor does the argument itself often play a very important part in bringing about a decision in the matter. The New Jersey Fish and Game Commission in a recent report gives some figures which are of interest in this connection.

The value of the shad taken by the Delaware valley fishermen in 1920 was estimated at $88,377, while this year it has been only $28,985. This decrease is believed to be due to stream pollution. Another instance which would seem to be much more conclusive is that of the Maurice river. A few years ago practically no shad were found in this river, which received considerable sewage. In 1915 there was organized action against the pollution of the stream which resulted favorably, and this year 9,600 shad were caught in that river, it being the one stream in the state in which shad fishing was satisfactorily profitable this year.

Sewage is not the only pollution endangering fish. A new source of such pollution is found in the oil tankers and oil burners which dump their waste at sea or in the approaches to harbors and these are endangering the coast fisheries. An additional damage done by these oil burners is the pollution of the bathing beaches and also the endangering of shipping in the harbors, where the floating oil may and sometimes does catch fire.

Control of Tourist Camps in Florida

Sometime ago PUBLIC WORKS called attention to the desirability of oversight by local or state health authorities of the various camping sites being used by autoists throughout the country. Recently the state board of health of Florida issued a bulletin admonishing municipalities in that state to so supervise and manage the camps used by auto tourists as to make them both agreeable to the tourists and safe from a sanitary point of view, warning that unsanitary camps would be condemned as fast as found.

Says the bulletin: "Tourist auto camps are an institution in Florida. Whether these camps are good or bad for the community, they are here and must be supervised. During the winter season of 1920-21 there were many faulty camps in the state; the faults, however, were not so much with the camps as with the lack of supervision or management of them by municipalities wherein they were located. As a result of poor municipal supervision, many of the camps were grossly criticized, condemned and subsequently abandoned. In several cities ordinances were adopted prohibiting any further municipal camps."

Many towns advertised camps as a bid for tourists, but made no provision for keeping them sanitary. In some instances the camps were really used as homes by winter laborers. In some cases objection was found because commissaries were established at the camps and sold food to the campers at a lower price than it could be obtained at the neighboring towns.

"There were some excellent camps in Florida last year. The camp at Deland was a model, also that in De Soto park of Tampa. In the latter camp there were at all times about 1,000 campers under strict municipal supervision and everything went well. The cities of West Palm Beach and Bradentown have recently promulgated very business-like, comprehensive ordinances to handle camps. The West Palm Beach ordinance defines the limits of the camp grounds; it creates an office of camp superintendent with police and managerial authority; it requires that all tourists desiring to enter the camp apply to the superintendent, giving name of person in charge of party, number in party, permanent home address, make and number of automobile, length of stay in camp. A fee of 25 cents per day is charged for use of camp, this sum to go to a fund provided for the special service rendered the tourists in camp. The camp will operate in strict accordance with regulations of the state board of health. The ordinance goes into a number of details regulating the conduct of the tourists and the orderly maintenance of the grounds. In every way the ordinance is complete and under it the camp will be assured of decent supervision."

American Public Health Association

Fiftieth annual meeting and semicentennial celebration held in New York City, November 14th to 18th. Unusually valuable papers and discussions before the Sanitary Engineering Section.

The fiftieth annual meeting of the American Public Health Association was held in New York city during November 14-18th and was one of unusual interest and large attendance. Of special interest to municipal engineers were the sessions of the Sanitary Engineering Section. A number of those who were present informed the writer that the several meetings of this section were the most satisfactory to them of any meetings that they had ever attended for the discussion of sanitary engineering matters. All meetings began practically on time, the speakers were limited to ten or fifteen minutes, and abundant opportunity was offered for discussion. Under these favorable conditions, the discussions were participated in by a considerable number of the 60 to 100 who were present at each of the meetings, among which were to be found most of the engineers of state boards of health and the other leading sanitary engineers of the country.

Merely to look through the list at random reveals the wealth of information that was on tap at these meetings. Papers were presented by George W. Fuller, W. H. Dittoe, Paul Hansen, Kenneth Allen, T. Chalkley Hatton, A. M. Buswell, J. Frederick Jackson, Langdon Pearse, Stephen DeM. Gage, M. N. Baker, A. E. Fisher, George T. Hammond, John E. Skinner, Earle B. Phelps, George C. Whipple, I. S. Orborne, Rudolph Hering, Olin H. Landreth, Andrew J. Provost, Robert Spurr Weston, Allen Hazen, C. A. Emerson, C. E. A. Winslow, C. A. Holmquist, Samuel A. Greeley and others. Among those discussing the papers were Harrison P. Eddy, Glenn D. Holmes, E. S. Rankin, Abel Wolman, J. R. Baylis, P. H. Norcross, in addition to those already named.

The Tuesday afternoon session of the Sanitary Engineering Section was devoted largely to business matters. On Wednesday afternoon the members attended the symposium on "Stream Pollution and Sewage Disposal" at the rooms of the American Society of Civil Engineers; while on Wednesday evening at the same place there was a general discussion on "Odors and Their Travel Habits," in which the matter of odors from garbage disposal plants seemed to be most in evidence.

On Thursday morning "Water Supply, Water Purification and Sewage Treatment" were the subjects under discussion. On Thursday afternoon an article on "Stream Pollution," three on "Bathing Places and Swimming Pools," and one on "Mosquito Extermination" filled out the program. On Thursday evening there was a symposium in the A. S. C. E. rooms on "Water Supply and Water Purification," which, like the other symposium, was attended by more than 100 engineers and sanitarians. On Friday morning the final meeting of the session was devoted to papers and discussions on refuse disposal, mill supplies and the zoning of cities.

As to the papers themselves, they were of such unusual interest that we hope to be able to present many of them in the columns of PUBLIC WORKS, either in full or in abstract. The Wednesday afternoon symposium began with a paper by George T. Hammond entitled "Tanks and Fine Screens for Treating Sewage," in which Mr. Hammond gave some results of experiments made in Brooklyn as well as others, showing the relative effectiveness of screens and tanks in removing suspended matter.

This was followed by a paper by Kenneth Allen describing the pollution of the tidal water of New York harbor by sewage and the reduction during the past few years in the oxygen present, the indication being that in parts of the harbor waters a limit had been almost if not quite reached beyond which any increase in the amount of sewage would produce a nuisance. Storm water treatment, with special reference to the methods and plant details employed in Rochester, were described by John F. Skinner, who called attention to the importance of treatment of storm water under many conditions where such treatment is not ordinarily accorded it.

The policies of the Pennsylvania Department of Health were described fully and clearly by W. L. Steveson, assistant chief engineer of the department, who brought out the fact well-known by sanitarians that that state is among the most progressive ones in its treatment of problems of stream pollution, sewage disposal, etc.

The paper on the program entitled "Intermittent Stream Pollution" had not been prepared by Paul Hansen, as he had been prevented from preparing it or being present by serious illness.

The "Deposition of Sludges Resulting from Sewage Disposal Plants" was the title of the paper by T. Chalkley Hatton, which dealt with the results obtained at Milwaukee with Imhoff and activated sludge plants, together with some of the other types of tanks with which experiments had been conducted.

Langdon Pearse presented a paper entitled "The Dilution Factor" in which he briefly summarized the history of the effects to find a satisfactory expression for this factor. He concluded that, from the standpoint of sewage dilution, "The problem reduces to noting the amount of pollution to be handled and the amount of oxygen available plus re-aeration." The paper will be published in full in PUBLIC WORKS within the next two or three weeks.

W. H. Dittoe, chief engineer of the Ohio state department of health, called attention to the abuse of sewers, especially those of the separate system, which were found in a number of cities of Ohio, this abuse being chiefly that of connecting water leaders to the small sewers, which resulted in overburdening them and sometimes in the flooding of the cellars of connecting buildings. On the other hand,

house sewage was sometimes found discharged into storm-water sewers. The situation had become so serious that the idea was even considered of entirely abandoning the use of separate systems and building all sewers on the combined system. He suggested however, as a possible remedy that cities make all connections to sewers by their own employees, or by licensed plumbers who would be held responsible for the occurrence of any such unauthorized connections. Discussion of this paper was taken part in by Harrson P. Eddy, Glenn D. Holmes, J. Frederick Jackson, Dr. Rudolph Hering, E. S. Rankin and some others. Dr. Hering stated that he believed Oxford and Reading were the only cities in England that were constructing sewers on the separate system. Mr. Rankin stated that the older section of Newark was sewered on the combined system but some of the newer sections on the separate system, and that the failure of owners in the separate system districts to understand why they should not have the same privilege of connecting rain water leaders to sanitary sewers as those in the older part of the city had lead to a considerable misuse of the smaller sewers in the way indicated by the paper.

Thursday morning's session opened with a paper by George W. Fuller giving a review of "Sanitary Engineering During the Last Fifty Years," in which it was brought out that sanitary engineering really had not existed as a science fifty years ago, the germ theory of disease had not been established and the art of filtering water was practically unknown in this country.

"The Proper Size of Sand for Rapid Sand Filters" was discussed by W. H. Dittoe, in which he explained why the Ohio state department of health was insisting upon the use of fine sand in the construction of filtration plants in that state. He classed as "coarse," sands with an effective size of more than 0.6 mm. and as fine those of 0.45 mm. or less, and stated that results from filters using the former size were not uniformly acceptable, while those using the fine sand averaged up very much better. The effective size which they recommended for filter sand was between 0.35 and 0.42, with 1.8 as a desirable co-efficient of uniformity. This led to some discussion of sand sizes, sand stratification in beds by use, the significance of effective size and uniformity coefficient, etc. Mr. Dittoe stated that they considered that a plant should produce, under the worst conditions of water, absence of gas in 10 cc. samples at 37 degrees, for 24 hours in lactose broth; also that each part of a purification plant should take its appropriate share of the burden with satisfactory efficiency and without overloading. It was recognized, however, that in any case probably 5% of the samples would show gas, but the number should not exceed 20%. He stated that a large part of the efficiency of the Ohio plants was undoubtedly due to the expert operation which they received, at least 15 of them being in charge of the men of the highest technical efficiency.

Wellington Donaldson read a paper entitled "Industrial Wastes in Relation to Water Supplies," in which he told of several ways in which industrial wastes might affect supplies, such as by clogging filters, by lessening of effect of coagulants (as is done by tannery liquors), lessening of effect of chlorine or causing it to give a taste to the water. Also the poisoning of supplies, as in the case of lead, arsenic, etc.

Further information concerning the experiment on sewage treatment at Milwaukee was given by Mr. Hatton in a paper entitled "The Use of Centrifuges for Dewatering of Sludge." Mr. Hatton believes that, while a perfectly satisfactory solution of sludge dewatering has not yet been discovered, the appliances which have been tested have shown that it is perfectly practicable to prepare sludge for use as a fertilizer or other methods of utilization.

A year or two ago an experimental plant consisting of a Dorrco screen and a Dorr-Peck activated sludge tank was installed at Urbana, Ill., by the Illinois water survey, and this plant and the results obtained from it so far were described by A. M. Buswell, chief of the water survey, who showed on the screen photographs and diagrams of the plants and tabulated data of the result.

In the afternoon, following a report of committees, papers were read by J. Frederick Jackson on "Correlation of Stream Pollution Criteria from Studies of Naugatuck and Hockanum Rivers in Connecticut"; by George W. Simons, Jr., giving a report of the committee on bathing places; by Stephen DeM. Gage and Attmore E. Griffin discussing "Sanitation of Bath Houses at Public Bathing Beaches"; by W. F. Walker describing installations for "The Treatment of Swimming Pools by Ultra-Violet Rays," and by W. V. Becker giving "Suggestions for the Extermination of Mosquitos."

On Friday evening another symposium was held at the rooms of the American Society of Civil Engineers on "Water Supply and Water Purification." At this symposium Prof. George C. Whipple gave an excellently condensed but complete "History of Water Purification." This was followed by a paper by Allen Hazen entitled "Relation of Character of Water to Design of Water Filtration Plants." In this paper Mr. Hazen gave special emphasis to the desirability of purifying water without chemicals, at least under certain conditions where an "active" water would produce undesirable results, such as attacking pipes and other metal structures.

"Interference with Water Filtration Plant Operation by Wastes from By-product Coke Ovens and Gas Works," a problem which affects a considerable area of Pennsylvania, was discussed by C. A. Emerson, Jr., chief engineer of the Pennsylvania department of health. Mr. Emerson showed how considerable amelioration or elimination of these difficulties had been obtained in certain plants by their using the waste waters repeatedly in cooling or other processes about the plant until evaporated, instead of discharging them into the river.

Prof. C. E. A. Winslow, in a paper entitled "Reduction in Typhoid Death Rate," presented an analysis of figures for the typhoid death rates during the past decade, both in the country at large and in the registration area, which apparently indicated that in the latter the reduction in typhoid death rate had been greater in the rural than in the urban districts and was at present lower in the former than in the latter; a condition which is exactly the contrary to that which has ordinarily been believed to exist. This was followed by a paper by C. A. Holmquist showing how the typhoid death rate in New York state had been reducted very greatly by water purification and improvements in the water supplies of the state, there having been a continuous, although of course diminishing, decrease in rate since the

state board of health had begun to exert its influence in the matter.

"The Purification of Soft, Colored Waters" was discussed by Robert S. Weston, who described how some of the New England waters, many of which are at present more highly colored than those of most other sections of the country, can have their coloring matter eliminated to a large extent. The papers concluded with one by Samuel A. Greeley entitled "The Operation of Reservoirs for Water Supply"; following which there was a very interesting discussion for half an hour or so on the papers of the evening.

The final session of the sanitary engineering section was held on Friday morning, opening with a report of the committee on refuse disposal by M. N. Baker, in which was given a brief statement of the present status of refuse disposal and a comparison of the methods which are available, reference being made to Hering and Greeley's book on "Collection and Disposal of Municipal Refuse" as the most important feature of the year in this branch of engineering. A paper by E. A. Fisher describing "The New Garbage Reduction Works at Rochester" was read by John F. Skinner in the absence of Mr. Fisher. This gave a condensed general description of a plant embodying the Cobwell system of reducing garbage which has just been completed in Rochester. This was followed by a discussion on the subject of garbage disposal in which a number of members took part. Mr. Hatton stated that a few months ago, while visiting Berlin, he had learned that the method of burying garbage which had been followed by that city for several years was no longer considered satisfactory because of the long haul involved and the large area of land thus withheld from intensive cultivation and occupation as a residence district. It was stated that in Chicago a reduction plant is operated by the city at a loss (see page 412 of this issue); also that the health board did not consider the garbage in any way a health matter, even if it was simply piled up in the back yards and not removed at all.

The balance of this session was occupied with a report of the committee on milk supply by H. A. Whittaker and a paper on "The Physical Effects of Pasteurization and Other Temperature Treatments of Milk" by Drs. Heulings, Pease and Towne; and a paper by Charles B. Ball entitled "The Health Value of the Zoning of Cities."

Hiram F. Mills' Engineering Bequests

The late Hiram F. Mills, Hydraulic Engineer, left several bequests to engineering interests, including $10,000 to the Reneslaer Polytechnic Institute and the Massachusetts Institute of Technology, $2,000 to the American Society of Engineers, $1,000 to each of the New England Waterworks Associations and the Boston Society of Civil Engineers and $5,000 to the American Academy of Arts and Sciences besides the bequest of $200,000 to Harvard University to establish a fund for the investigation and origin and cure of cancer as a memorial to Mrs. Mills.

Freezing of Concrete

The Engineering Experiment Station of the University of Illinois has just published a bulletin entitled "Studies on Cooling of Fresh Concrete in Freezing Weather," by Tokujiro Yoshida, being Bulletin No. 123 of the series published by the station.

The practice of placing concrete in freezing weather renders important a knowledge of the rate at which this material will cool, and the effect of the various methods of protecting the freshly placed concrete from the cold.

This bulletin deals with certain experimental work carried on at the Engineering Experiment Station of the University of Illinois with the object of obtaining data on the length of time required for concrete of a given temperature to lose its heat and become cold enough to freeze when it is exposed to temperature lower than the freezing point of water. Some experiments were made on the protective effect of coverings.

While it is probable that these experiments do not give complete data regarding concreting in freezing weather under all possible conditions, it is considered that they throw some light on the behavior of fresh concrete at low temperatures, and indicate the necessity of protection or other precautions.

Copies of Bulletin No. 123 may be had without charge by addressing the Engineering Experiment Station, Urbana. Illinois.

Substitutes for Cut-Back Asphalt Cement

During the war cut-back asphalt cements were almost unobtainable for road making purposes and in 1918 the Committee on Broken Stone and Gravel Roads of the American Society for Municipal Improvements presented a specification known as "Temporary Substitute for Road Oil," which was for a cold application to be used on such roads. This substitute was described on page 362 of the Proceedings of that society for 1918.

Considering that the cut-back material is still quite expensive, although there are now no restrictions placed upon the use of it by the government, and in view of the fact that most excellent results have been obtained by using this substitute material, the committee this year recommended to the society at the Baltimore convention that the specifications be retained as a part of the standard specifications of the society. The cut-back asphalt cement for which this is a substitute consists of a mixture of asphalt cement and naptha. The specifications require that in the case of the cut-back cement, when tested by means of the Engler viscosimeter at 25 degrees Centigrade, the specific viscosity of the first 50 c.c. passing the orifice of the viscosimeter shall be between 25 and 35, while the similar test of the substitute would have a range between 80 to 120.

To Purify Kaw River, Kansas

A few weeks ago, the state board of health of Kansas called a conference of representatives of 13 Kansas towns to discuss the proposition of preserving the purity of the water of the Kaw river. Dr. S. J. Crumbine, secretary of the state board of health, said that with the increase in population of the cities along the river the pollution of the river was increasing, and the time might come when it would be necessary for the cities to treat their sewage. Apparently the object of the board was to urge the towns to take such precautions as they could in order to postpone as long as possible the time when the construction of sewage disposal plants would become necessary.

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A Successful Convention

The average engineer, we believe, attends conventions of his professional societies with two main objects in view—obtaining information and meeting his fellows in the profession. Those who present papers do so because urged to it by the officers, or because of the favorable attention such papers direct to themselves, or for both reasons.

In too many conventions the meetings do not begin promptly at the appointed time, as a consequence of which much of the time of the members is wasted and few are present during the first few minutes of each session. The papers are not limited in length, and some long-winded speakers monopolize the time and crowd out discussion, the meetings lack "pep" and drag along, and much of the benefit that might be contributed by the discussions is lost.

The convention of the American Public Health Association, Sanitary Engineering Section, and the symposiums arranged by the American Society of Civil Engineers in connection therewith, were as nearly models as any meetings the writer has attended in a long time. The sessions began promptly at the hour set, papers were limited to ten or fifteen minutes (and it is remarkable how much can be said in that time if the writer has taken pains to condense his paper and knows that its length is limited) and discussions limited to shorter periods. Although 9:45 A. M. seemed late to begin, the morning sessions *began* at 9:45, which is more than can be said for 9 o'clock sessions in some societies; and the hour before this, and especially the time before the 7:45 P. M. session, was free for social and professional conversation by even those who were conscientiously prompt in attending the formal sessions.

And the papers were well worth while. The committees had apparently seen to that and obtained discussions on timely topics from recognized specialists in the several lines. To the sanitary engineers who were present, at least, the convention was a most successful one and several stated to the writer that it was the best of any they had ever attended.

A Sanitary Section of the A. S. C. E.

Several members of the American Society of Civil Engineers who specialize in sanitary engineering have, for two years past, been meeting together at a dinner held during the annual meeting of that society, for an interchange of ideas to their mutual advantage and pleasure. The success of the Sanitary Section of the American Public Health Association has suggested the desirability of a similar section in the A.S.C.E.

The latter society is abundantly large to permit of sectional meetings to advantage, and the interests of the members are so diversified that very few subjects of discussion are of interest to more than ten to twenty-five percent of the members. There thus occurs a natural segregation into unofficial sections in the attendance at the meetings, and there would seem to be several advantages in recognizing this officially by the formation of sections, which would meet separately and have each its own chairman and secretary. We hope the matter will be given careful consideration between now and the time of the annual meeting.

"Sanitary Sewers"

There are no accepted autocrats in language, but the majority of the intelligent people decide what words the lexicographers shall from time to time add to their dictionaries, and what meanings they shall give them.

The editor of PUBLIC WORKS bows to this majority. For twenty years he has advocated what he considered to be a consistent use of the terms "house sewer" and "storm sewer" to designate the conduits receiving the waste water from houses and rain water run-off respectively. During fifteen years of this time a majority, probably, of the students of sewerage in engineering schools have used as a text book, "Sewerage," in which this use of the terms is employed, and during the past ten years committees of at least two national organizations have advocated

such use and declared the use of the term "sanitary" sewer to be supported by no logical argument.

In spite of this, the term "sanitary sewer" seems to have been adopted for general use by the younger engineers. Most recent papers before societies, municipal reports and other writings of engineers employ it. If we and they are to understand each other we must use the same language. And although the term *sanitary* sewer seems to us an absurdity, we will use it in the future in this publication in order to conform to the usage of the majority.

How to Select, Install and Operate a Concrete Mixer

Permanent equipment required on all kinds of construction work demands most efficient, durable and standard machines. Number, size and type depend on local conditions, amount and character of work. Operations should be continuous and to fullest Capacity. Ordinary difficulties can be averted or corrected

Most experienced contractors have one or more favorite makes of mixer, which are often replaced by duplicate orders whenever any of them are worn out or additional ones are needed. It does not, however, follow that the selections, often made casually at first, are the wisest. It would be well for all contractors to pay careful attention to the subject, determine what are the best sizes and makes of mixer for them to use, and why they should be used and govern themselves accordingly in future purchases of equipment. In this way they can, without extra cost, make their plants conform to a fixed policy and have their machines ultimately standardized and duplicated to secure the highest efficiency and economy, matters of importance to contractors commencing to accumulate equipment and gain construction experience and reputation.

Although it is possible to mix concrete well by hand, it is generally discouraged and often prohibited by specifications, except in very small quantities or in isolated positions where the installation of a machine would be very difficult or expensive. The facts that the work can be done much more rapidly, efficiently and continuously by a machine and at a unit cost greatly below that of hand work, and that the use of the machine eliminates a large amount of sometimes unreliable hand labor, make a mixer the first requirement of every contractor. A concrete mixer can be used, not only to mix concrete, but various other substances, especially mortar, not to speak of the use to which one is put on Long Island where one of the machines is installed to mix the feed of an enormous number of ducks raised for the Metropolitan Market. These machines or modifications of them are also successfully used for mixing plaster, fertilizer, and various other materials.

CONCRETE MIXERS

For their fullest efficiency continuous mixing machines should be equipped with large storage for cement, aggregate and water and reliable automatic measuring and delivering service and abundant facilities for continuous distribution of the finished concrete. In case of necessity these machines can, of course, be operated intermittently and have separate measured quantities of materials passed through them as in an ordinary batch machine, but such operation eliminates the special advantages the machine is designed to secure without giving those specific to the batch machine. An early type of this machine, now seldom used, consisted simply of a long open trough, with concentric revolving shaft having radial arms or blades, pitched to move the material from one end of the trough to the other somewhat after the principal of a worm conveyor.

Another continuous machine of very simple construction, that could be made by ordinary mechanics, consists simply of a long vertical or steeply inclined chute or tube provided with interior baffle plates, projecting arms or their equivalent. The materials being emptied into a hopper at the top of the mixer fall by gravity to the bottom and in transit are thrown from side to side and more or less thoroughly mixed in their descent.

Another type of gravity machine that, although used as a batch machine, might be uninterruptedly supplied with measured quantities of materials and operated as a continuous machine, is the multiple hopper machine, in which a series of hoppers are vertically super-imposed and the materials falling from one pyramidal or conical hopper into the one below are more or less completely turned over in the descent and are mixed wholly by the transverse motion and rolling effect of the downward and sideways progress of the heavy charge moving wholly by gravity. It is claimed that it is turned over in passing through each of the three or four hoppers to the receiving hopper below.

These machines are simple in construction and can be built of any required dimensions, but like other gravity machines, cannot provide for any variation or modification in the manner or duration of the mixing. All gravity machines are obviously subject to the universal law that it is impossible to get something for nothing and as the efficiency of mixing must correspond in at least a minimum expenditure of power in the mechanical operation, it must require a certain considerable height of fall and very efficient turning over appliances to equal the rolling and pitching and kneading effect of power machines.

REVOLVING MACHINES

Batch machines are mostly of the revolving type, and constitute a very large proportion of all machines used in this country. They generally have a capacity of from ¼ cubic yard up to a maximum of 4 or 5 yards. They receive a premeasured quantity of materials and, unless cubical, are equipped with fixed or moveable interior blades, projecting from the inner surface of the drum that are so arranged as to lift and shift and drop the aggregate as the drum revolves, producing a rolling and even kneading action that is very efficient and usually suffices for a satisfactory mixture after 10 or more revolutions of the drum occupying from ½ a minute to 2 minutes according to requirements. The average time being about 1 minute of actual mixing. In some

types the machine is both charged and discharged while in revolution and in others, as in the cube, it must be stopped to receive the material and discharge the concrete.

For several years efforts have been made to mix concrete by the forces provided for its transportation, especially when the aggregate is stored and measured at a distance from where the concrete is placed. There is now on the market a machine, mounted on an auto truck and operated by the regular engine of the latter, that is changed by gravity from elevated bins, mixes the concrete in transit, preferably at the end of the route, and dicharges by gravity through a chute that may be moved by the truck as it delivers so as to speed the concrete.

PNEUMATIC MIXERS

Within a few years considerable attention has been devoted by prominent manufacturers to the development of pneumatic mixing machines in which the concrete shall be mixed by the operation of jets of compressed air in a closed chamber. These have been usually operated in connection with pneumatic conveying apparatus, by which the mixed concrete is forced through a 4 to 8-inch pipe to the required position in the forms. Both operations require a considerable amount of compressed air and therefore involve a compressor plant that is expensive to install and operate for mixing purposes alone, so that the pneumatic mixer is usually best adapted to situations in which there is very little working room and it is important to avoid obstructions, as particularly in small tunnels.

For general purposes the revolving type of batch machine is satisfactory and several makers have developed it to a high degree of efficiency and economy, but the other types have been useful and will be useful when conditions make them more convenient or are especially suited to their peculiar features.

SELECTION OF MIXER

Unless it is required for a job of such great magnitude or duration that its execution outweighs all other consideration, the concrete mixer should be selected with a view to its future use on the character of work that the contractor is likely to undertake thereafter. In any event the machines should be simple, efficient, powerful and durable, of high class materials and workmanship and easily operated. It should be of simple and sturdy construction and easily assembled, and should be supplied with spare parts of any sort that may be especially likely to failure or rapid wear so that they can be replaced with the minimum cost and delay if necessary, but in a first-class machine such replacements are rare and with good care the machine will operate for a long time without danger of breakdown.

It is, however, advisable that the machines should be all of one standard make and if possible of only one or two sizes, so that a few spare parts may serve for the entire equipment and that the operators soon become thoroughly familiar with the machines and their requirements and are not confused by shifting from one machine to another.

It is also important that the machines be fitted for operation with steam, gasoline or electric power as may be most desirable, and at present the gasoline motors are likely to be most convenient and economical in a majority of small or moderate size jobs.

The tendency at the present time is strongly toward the use of multiple units of small capacities rather than of very large machines, and the extremely small machines down to a capacity of ¼-cubic yard per batch are increasingly popular, although a great many machines of ¾-yard capacity are in use. For special work where a very large amount of concrete is to be placed in one mass, as for instance in huge ship canal locks, great foundations or enormous dams where provision is made for handling the concrete continuously through chutes or in large conveying apparatus, one or more especially large machines are sometimes installed.

Ordinarily, however, a number of small machines is better for various reasons. They are carried in stock and can be quickly purchased and delivered. They are very much lighter and the freight charges are less. They are more easily transported, handled and installed. They require no costly foundations and can be set on their own trucks or on timber sills. The use of a battery of mixers is substantially equivalent to maintaining reserve equipment, since only one of a number of mixers is thrown out of service and the rest may continue in operation while the one is repaired. They are far more flexible and can be shifted from point to point on the job or when the bulk of the work is done a part of them can be moved and put on other work; they can be easily moved so as to receive aggregate directly as it is brought to the site. They are more saleable at the close of the job and have a higher cash value than large machines.

MOVEABLE MIXING PLANTS

The smallest size machines are frequently mounted on wheels so that they can be easily moved by hand for moderate distances over level ground. They may also be placed on skids that serve not only to shift them from place to place, but answer as settings for them while in operation.

For special purposes a small machine has been mounted on a motor truck equipped with storage for cement, water and aggregate for a few yards of concrete and is thus quickly available for operations at any remote place or for immediate repair or urgent service of any kind, carrying all of the necessary equipment for doing a small job with a crew of men that accompany the trucks and are not required to wait for delivery of machinery or material. In case the job requires more concrete than the supply from the storage on the trucks the quantity can easily be doubled or trebled by hauling it on a trailer or by a service truck provided for the special purpose.

Whenever a considerable amount of work is done on the waterfront it is generally desirable to install the mixer or mixers on one or more barges that can easily be fitted with loading, unloading and hoisting apparatus and very readily shifted from point to point with only a few feet at once to keep within the most convenient distance of the work in order to deliver the concrete directly to it by derricks or by spouting. The barge may have storage for a considerable amount of cement and aggregate, but is frequently provided only with small service hoppers that are filled from a material scow alongside, which can be replaced as often as necessary and enable the small hoppers to always provide immediately supplies by gravity to the mixers.

Similarly traveling plants may be installed on shore and have a platform on which the mixer is set with

service storage bins alongside and usually the derrick to maintain the latter filled with aggregate, the whole equipment being easily moved on a broad gage track as required. An equivalent of arrangement is provided by the installation of the mixer, storage bins and loading and unloading apparatus on a railroad car that may be supplied with aggregate from tenders brought alongside or in the same train with it and served by hand or power.

(To Be Continued)

Proposed Brooklyn--Richmond Tunnel

$141,000,000 commercial development scheme for a belt railroad, serving Brooklyn, all of Staten Island, and a large territory in New Jersey with a tunnel under the Narrows and a high level bridge across Arthur Kill

In 1921 the legislature of New York directed the Board of Estimate and Apportionment of New York City to construct a freight and passenger tunnel connecting the boroughs of Brooklyn and Richmond in Greater New York. A preliminary report on the construction of the tunnel and its connections has been made by representatives of the Pennsylvania, Long Island, and Baltimore & Ohio Railroads and the Board of Estimates' committee.

This report points out the impracticability of developing existing railroad lines to serve the tunnel and for the transfer and distribution of freight connected therewith, and recommends in a general way the construction of a belt line railroad which would serve a large territory in New Jersey, the whole of Staten Island, the western end of Long Island, and reaching to Manhattan Island, provide connections with all existing railroad systems through New York, and, with the tunnel across the Narrows and a high, level bridge across Arthur Kill from Staten Island to New Jersey insures ample physical connection with the mainland. It provides for a large classification yard in the borough of Richmond and gives alternate locations for the alignment of the tunnel and for the road crossing Staten Island. The total cost of the project is estimated at $141,000,000. The Committee recommended that application be made for the authorization of borings, the preparation of plans, and the approval of construction types.

The plans provide for connection with the railroad systems above mentioned, and with the New York Central and with the New York, New Haven & Hartford Railroads and for an industrial railroad traversing the intensively developed Brooklyn water front along the upper bay, facilitating industrial development in Jamaica and Flushing and districts and the Bronx and providing for connections with the $20,000,000 municipal piers on Staten Island and rail service for ever Borough of the city.

The comparisons of plans and estimates for fifteen separate and distinct routes having 1 percent and 2 percent maximum grades indicated a saving of $15,000,000 for the construction of the 2 percent maximum, which was therefore recommended. Consideration was also given to the construction of the tunnel made by the twin tubes method, by the shield driven method, and by the trench method, between which no final choice has yet been made. It has been established, however, that the tunnel is entirely practicable and with its terminal connection can be built at a cost of about $51,000,000.

A freight traffic of 22,500,000 tons annually is estimated from the records for 1914, plus the assumed increase of 2 percent yearly; it is also assumed that the 1918 cost of $9.50 per car for handling the freight will be reduced to $3.75 per car, a saving, which after paying the fixed charges of the project, is estimated at $5,000,000 annually.

The principal advantages claimed for the project are that it will effectively serve the entire length of Staten Island; provide for economy of construction and operation of the classification yards; permit advantageous trench construction of the tunnel; provide for future rail connections with the New Jersey water front at Constable Hook; provide passenger service for the most populous part of Staten Island; is not likely to be opposed by property owners in Brooklyn; minimizes possibility of interference with future water main crossings of the Narrows; obviates the necessity of negotiating with holding companies concerning franchises for rights in connection with the main freight project; affords military protection in time of war; will develop dormant areas in the outskirts of the metropolitan districts; will unify terminal service of 10 trunk lines; will afford freedom from harbor interruptions due to fogs, storms, ice, high tides, and marine strikes; will provide work for unemployed labor and capital; and will virtually transform New York from an island to a mainland city.

Long Span Ohio River Highway Bridge

Work has been commenced by the Dravo Construction Co., Pittsburgh, on the $250,000 substructure for a highway bridge across the Ohio River from Ironton, Ohio, to Russell, Ky., that will have an estimated total cost of $700,000.

Besides viaduct approaches and the 200-foot shore spans the river crossing will consist of two 350-feet anchor spans and a 725-foot cantilever that is somewhat remarkable for its proportions of 175 feet for the cantilever arms and 350 feet for the suspended span. The bridge will have riveted trusses 29 feet apart on centers and a wooden plank roadway floor 20 feet wide and about 100 feet above normal water level. The three reinforced concrete river piers have I-shape cross sections with shallow foundations on bed rock.

Recent Legal Decisions

A SCHOOL DISTRICT IS A MUNICIPALITY

The word "municipal" as originally used in its strictest sense, applied to cities only, but now has a much more extended meaning, and when applied to corporations, the words "municipal," "political," and "public" are often used interchangeably. The Pennsylvania Superior Ct. 305, that a school district is a quasi corporation for the sole purpose of administering the Commonwealth's system of public schools, and vitally associated with the education of children in protecting their health, so that it is reasonably embraced within the designation of "municipality." As such, it is within the statute requiring compulsory vaccination for the public health in the "several municipalities" of the Commonwealth.

LEGAL WIDTH OF STREETS—POWER TO WIDEN AND ASSESS OWNERS

A city street was originally dedicated by a property owner at a width of thirty feet. Subsequently the city sought to increase the width by an ordinance locating the street at a width of forty feet. This ordinance, however, was held invalid as an attempt to widen an established street without proceeding in the manner required by the statute. Sometime afterwards, the city paved the street at the original width of thirty feet, as dedicated. The board of viewers assessed an abutting owner's property for benefits. The owner objected on the ground that the legal width of the street was forty feet, and that the city had no right to improve it at a width of thirty feet. It was held, Sborigi's Appeal, 75 Pa. Superior Ct. 145, that the ordinance widening the street having been declared invalid, the original width as dedicated was the legal width, and the assessment was properly made.

DAMAGES FOR FAILURE TO DELIVER SITE TO CONTRACTOR IN TIME AND FOR CHANGE IN PLANS CAUSING EXPENSE AND DELAY

The federal district court for the Northern District of Ohio holds, Bates & Rogers Const. Co. v. Board of Commissioners, 274 Fed. 659, that a contract for the construction of approaches to a bridge carries an implied covenant to furnish and deliver the site in a condition to permit the work to be done, and that a failure so to do is a wrongful breach of the contract, for which the contractor may recover damages. Where there was no express provision when the site would be so delivered, it was implied that it should be ready for delivery either on execution of the contract or within a reasonable time thereafter. And where the work was to be done according to plans and specifications then on file, the contractor might recover when a subsequent change in the plans was made to meet new conditions and improvements not in contemplation of the parties when the contract was executed, requiring excavation to a greater depth and modification of design of certain parts of the work to be done, and thereby causing great delay in the completion of the entire contract.

POWER TO SELL CITY'S REAL ESTATE AT PUBLIC AUCTION—EMPLOYMENT OF AUCTIONEER

The Ohio Supreme Court holds, State v. Carrel, 132 N. E. 161, that a city under Ohio Gen. Code, §3699, has power to sell at public auction real estate belonging to it when such real estate is no longer needed for municipal purposes. But, the section providing that the contract shall be made in writing by the officer having supervision or management, and only with the highest bidder, which officer may reject any or all bids, it is thereby made the duty of the officer to attempt to make the sale, and, it being required of him as an official, the city has not the power to employ and pay an auctioneer to make the sale.

VACATION OF STREETS—BENEFITS TO PRIVATE INTERESTS

The Illinois Supreme Court holds, People v. Elgin, J. & E. Ry. Co., 132 N. E. 204, that the presumption of law is that the public officials constituting the city council discharge their duty to the public, and the courts will not declare an ordinance vacating a street void merely because some private interest may be served by the vacation. It must clearly appear that no consideration of public interest could have led to its enactment.

COUNTY ROAD WORK IN NEW JERSEY

Through the courtesy of the secretary of the New Jersey Association of County Engineers, Harry F. Harris, we have received a statement of the amount of work done by 19 of the 21 counties during the year 1921. These figures do not include any work done by the state highway department, nor work on the state highway system carried on by the counties under the Reimbursement act, which permits the State Highway Department to allow counties to proceed with work on the state highway system and reimburse them three or four years later, or whenever state funds are available.

These figures show that 204 miles of roads of all types had been completed by October first and that 53.8 miles were still under construction and 9.4 miles under contract ready for construction.

Of the roads already completed, 11.12 miles were of sheet asphalt on concrete base, 17.43 were sheet asphalt on stone base, 23.98 were bituminous concrete on concrete base, 15.18 were bituminous concrete on stone base, 43.91 miles were concrete, 0.46 were brick, 1.11 were stone block, 12.22 were penetration macadam, 21.22 were waterbound macadam, and 57.32 were gravel.

Of the amount under construction, 4.66 miles is sheet asphalt on concrete base, 4.30 sheet asphalt on stone base, 3.10 is bituminous concrete on concrete base, 3.15 is bituminous concrete on stone base, 7.57 is concrete, 3.33 is block, 2.03 penetration macadam, 25.04 is gravel and 0.61 is other types. Of the roads under contract ready for construction, 1.61 is sheet asphalt on concrete, 1.42 is concrete, 0.66 is block, 2.53 is waterbound macadam and 3.20 is gravel.

These figures show that the various bituminous roads constitute 31.64% of the total, concrete constitute 19.78%, and penetration and waterbound macadam 14.22%.

NEWS OF THE SOCIETIES

Nov. 28-29—KANSAS CITY SECTION AEMRICAN SOCIETY OF MECHANICAL ENGINEERS. Two-day regional meeting. Secretary, Louis Bendit, 517 Finance bldg.

Dec. 1-3 — MONTANA IRRIGATION AND DRAINAGE INSTITUTE. Great Falls, Mont.

Dec. 5-8—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. Omaha, Neb. Secretary, J. H. Mullen, St. Paul, Minn.

Dec. 5-9—AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual convention. New York City.

Dec. 6-9—AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. 14th annual meeting. Baltimore, Md.

Dec. 13—ENGINEERING SOCIETY OF BUFFALO. Iroquois Hotel, Buffalo. Secretary, N. L. Nussbaumer. 80 W. Genesee Street, Buffalo.

Dec. 14 — NEW YORK SECTION, AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Engineering Societies' building, New York City.

Dec. 15—ENGINEERS' CLUB OF CINCINNATI. Cincinnati.

Dec. 22-23—KANSAS ENGINEERING SOCIETY. Annual meeting. Hutchinson, Kan. Secretary, J. M. Averill, Topeka.

Dec. 22-23—KANSAS ENGINEERING SOCIETY, Hutchinson, Kan.

Dec 27-31 — AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, SMITHSONIAN INSTITUTE, Washington, D. C. Toronto, Canda.

Jan. 4-14 — CLEVELAND, OHIO, BUILDING EXPOSITION. Municipal auditorium, Cleveland, Ohio.

Jan. 17-20 — AMERICAN ROAD BUILDERS' ASSOCIATION. Annual Convention and good roads show. Chicago, Ill.

Feb. 12-17 — CONFERENCE OF HIGHWAY ENGINEERING. 8th annual conference. University of Michigan, Ann Arbor, Mich.

Feb. 15-17—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Tenth midwinter convention. Engineering Societies' building. New York City.

Feb. 21-23 — MINNESOTA FEDERATION OF ARCHITECTS AND THE MINNESOTA SOCIETY OF CIVIL ENGINEERS. First annual convention, Curtis Hotel, Minneapolis.

Apr. 27-30—BUILDING OFFICIALS' CONFERENCE. Apr. 27-28, Cleveland, O.; Apr. 29, Massillon, O.; Apr. 30, Youngstown, O.

May 15-19 — AMERICAN WATERWORKS ASSOCIATION. Annual convention. Philadelphia, Pa.

AMERCIAN SOCIETY OF CIVIL ENGINEERS

The program for the adjourned November meeting of the Society, was divided into three sessions for the discussion of important topics at the afternoon meeting.

November 16.—There was a Symposium "Stream Pollution and Sewage Disposal." Speakers—George T. Hammond, Kenneth Allen, John F. Skinner, W. L. Stevenson, Earle B. Phelps, Paul Hansen, W. K. Dittoe, Langdon Pearse and T. Chalkley Hatton.

November 16, 1921, 8 p.m. — The Monthly Business Meeting was followed by a paper "Odors and their Travel Habits," by L. L. Tribus, published in August "Proceedings." Discussion led by George C. Whipple, Stephen De M. Gage, I. S. Osborn, Rudolph Hering, Olin H. Landreth, Andrew J. Prevost, and Robert S. Weston.

November 17—Symposium, "Water Supply and Water Purification." Speakers—George C. Whipple, Allen Hazen, C. A. Emerson, C. E. A. Winslow, C. A. Holmquist, Robert S. Weston and Samuel A. Greeley

FALL MEETING OF NEW JERSEY ASSOCIATION OF COUNTY ENGINEERS

Members of the Association and guests left Trenton 9.00 a.m., November 18th, via. Automobiles and inspected Brunswick Pike in Mercer and Middlesex Counties, and proceeded to Clarksville to Lawrence Station, to Mercerville, Hamilton Square, Route No. 1, to Hightstown, to Manalapan, passing over State Maintenance work; turn left, Manalapan to Englishtown, passing Molly Pitcher's well, and Monmouth Battlefield, thence to Freehold, and inspected interesting Monmouth County work thereabouts.

After luncheon at Lakewood, the party visited hangar built by Navy Department near Lakehurst for ZR-2 and proceeded over gravel roads through Monmouth, Burlington and Atlantic Counties, along Jersey Coast, dining at Sea View Golf Club, between Oceanville and Abescon. Inspected nearby New Highway Lighting Scheme of General Electric Co. and held meeting at 9.00 p.m. at Hotel Dennis, Atlantic City. Saturday visited Atlantic County bituminous work during morning. Lunched at Bridgeton Country Club and in the afternoon inspected State work.

The following subjects were announced for discussion at the meeting:

Advisability of Counties building part of State Highway System under Reimbursement Act, as proposed by Highway Commission.

Exchange of ideas with Delaware and Pennsylvania Engineers.

Reports of Standing Committees.

Proposition of admission of Assistant County Engineers as Associate Members of New Jersey Association of County Engineers.

Establishment of a Clearing House for use of members of the Association, to be conducted by Secretary.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION

At the New York meeting of the Association, October 18-20, there was a record attendance and considerable attention was paid to the labor situation, involving large threatened strikes that were discussed by the presidents of the Central Railroad of New Jersey and of the Delaware & Hudson Company. A formal resolution was passed deploring the threatened railroad strike and expressing the loyalty of the association to the railroad service.

Among the principal committee reports were those on cinder pit construction that covered the deterioration of concrete pit walls, due to the action of hot cinders, and the use of fire brick lining. The committee on lining tunnels under traffic made a voluminous report, containing descriptions of important examples of re-lining timber lined and brick lined tunnels with concrete.

ASSOCIATED ENGINEERING SOCIETIES OF ST. LOUIS

The November 16th meeting of the Associated Engineering Societies of St. Louis was held under the auspices of the St. Louis branch of the American Society of Mechanical Engineers. C. C. Smith, chief engineer of the United Construction Co., gave an illustrated address on "The Construction of a Million Barrel Oil Refinery at Fall River, Mass., for the New England Oil Corporation," and D. A. Garber, past president of the Associated General Contractors, spoke on "How to Keep Engineers Steadily Employed."

BOSTON SOCIETY OF CIVIL ENGINEERS

The Boston Society of Civil Engineers held a meeting on November 16th, the subject of which was "Labor Problems of Today." There were addresses by James Gould, Carpenters' District Council; John T. Walsh, president of the Building Trades Council, and E. A. Johnson, secretary of the Building Trades Council, as representatives of organized labor. Participants in the general discussion were William Stanley Parker, Morton C. Tuttle, of Aberthaw Construction Co., and Charles R. Gow, of Charles R. Gow Co.

WASHINGTON SOCIETY OF ENGINEERS

The Washington Society of Engineers, at its meeting on November 16th, was addressed by Thomas Riggs, Jr., formerly governor of Alaska, on "The Problems of Alaska."

FOR TECHNICAL PAPERS

In accordance with a plan started in 1920 the Illinois Society of Engineers has offered five prizes of $25 for papers to be presented at the annual meeting at Decatur, Ill., January 24 to 26, 1922. There will be a prize for each of the following classes: (1) Drainage, (2) Roads and pavements, (3) Sewerage, (4) Surveying, (5) Miscellaneous civil and municipal engineering. This competition is limited to members of not more than five years standing and to candidates for election at the annual meeting. Papers must be submitted by January 1st and must be prepared in accordance with the rules and conditions. Full particulars may be obtained from E. E. R. Tratman, C. E. Secretary, Illinois Society of Engineers, Wheaton, Ill.

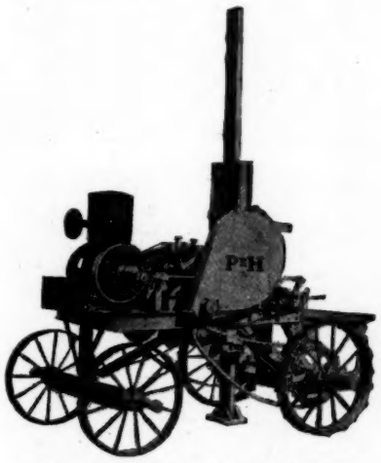
(*Continued on Page* 424)

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

NEW P & H POWER TAMPER

The accompanying illustration shows the latest model P & H Power Traction Tamper made by the Pawling & Harnischfeger Co., and having a number of improvements over the previous model. All chains and gears are supplied with enclosing guards, the tamper and steering cables used are ⅜-inch diameter instead of ¼-inch, new type traction wheels are furnished, with extension axles to allow for changing the tread from 58-inch to 76-inch. The standard tamping head is 150 pounds in weight as before.



POWER TRACTION TAMPER

Other refinements are embodied in the design which makes it an improved machine for speeding up the work of tamping all kinds of ditches and trenches. Only one man is required to operate it—control of the power ram and the forward or backward movement of the tamper being readily accomplished from the operator's seat.

CAST IRON PIPE FOR HOUSES SERVICES

The United States Cast Iron Pipe and Foundry Co., has issued a leaflet, "To Promote the Use of Cast Iron Pipe of Small Diameter for Waterworks Service in Houses."

It claims that cast iron pipe meets the 6 principal requirements for a good service pipe, namely, that it should not injuriously effect the water passing through it, that it should not impair the appearance, taste or odor of the water, that it should always have sufficient capacity, that it should be strong and durable, that it should be easily made, and that it should be inexpensive.

The company manufactures cast iron service pipe of a minimum diameter of 2 inches, ample for ordinary needs, especially as it is not as readily obstructed by interior accretions as are most other kinds of pipe. A special 2½-inch size is also manufactured for larger capacity if necessary, and all of the service pipe is covered with the standard water pipe coating accepted by the American Waterworks Association. The pipe is cast vertically, bell down, in 9-foot lengths, up to 3 inches in diameter above which it is cast in 12-foot lengths. Two-inch pipe is cast with weights of 8, 8½, 9 and 9.9 pounds per foot intended for service under corresponding pressure heads of 100, 150, 250, and 300 feet.

SMITH MIXERS

"On the Job with Smith Paving Mixers" is the title of a new Catalog (No. 409-B), issued by The T. L. Smith Company, 1125 32d Street, Milwaukee, Wis. Photographs taken on various jobs throughout the country of all sizes and types of Smith Paving Mixers, are featured, and also illustrate the various types of auxiliary equipment used by road contractors—industrial railway and batch boxes with paver derrick dump body trucks, automatic loaders, wheel barrow loading, etc.

Mechanical points of particular interest in Smith Pavers are shown by means of actual photos. Copies of this new catalog 409-B will be gladly sent free on request.

INDUSTRIAL NOTES

The Southern Power Co. is to build two new plants, the first an addition to the present plant at Great Falls, S. C., to be known as Great Falls Power House No. 2, and the second plant at a point twelve miles from Charlotte, N. C., to be known as the Mountain Island Station.

Payne Dean, Limited, 103 Park ave., New York City., manufacturer of Dean control for electrical operation of water, gas and high pressure steam valves, has established offices in Pittsburgh and Chicago, with C. J. Burrage in charge of the former and A. H. Kohibusch, in charge of the latter. The Pittsburgh office is in the Bessemer Bldg., and the Chicago office in the Lumber Exchange Bldg., 11 S. La Salle St.

The dedication exercises of the Arkansas Hydro-Electric Development Company, Dam No. 1, Little Red River, were held on Friday, November 4th, at Camp Livingston, White county. The dedication address was delivered by Governor T. C. McRae.

The Orton & Steinbrenner Co. of Chicago, manufactures locomotive cranes, clam shell and orange peel buckets, have made arrangements with the F. C. Richmond Machinery Co., 117 West Second St., Salt Lake City, Utah, to represent them.

The Koppel Industrial Car & Equipment Company who are large manufacturers of Industrial Cars, Narrow Gauge Track Materials, etc., have opened a new district office in the Railway Exchange Building, Kansas City, Mo. Harry C. Kraft, manager.

The Austin Machinery Corporation, Chicago, announces as its sales representatives for the general Illinois and Iowa-Mississippi territory the Gierke-Robinson Co., with offices at 615 Kahl Bldg., Davenport, Ia., opened November 1st. This company will handle a full line of Austin earth-removing road-building and concrete mixing equipment.

Cooley, Mortimer Elwyn, dean of the College of Engineering and Architecture of the University of Michigan, has been elected president of the American Engineering Council of the Federated American Engineering Societies.

MacCrae, Don, has been appointed consulting engineer for District 10, the Arkansas-Missouri Highway District and the Spring Lake District, Pulaski County, Ark.

The H. W. Clark Company announces an increase in its capital stock from $75,000.00 to $200,000.00 ($150,000 common and $50,000 seven per cent preferred cumulative).

RAPID TUNNELLING

The 11-foot 3-inch main tunnel of the Hetchy Hetchy Water System was, during the month of August, driven 776 feet through hard rock by F. P. Hickman working from the Priest Portal and operating 3 shifts per day. The area of the heading is 406 square feet, drilling was done by three Ingersoll Rand machines, the mucking by the Myers-Whaley machine. The schist and quartzite were blasted with 28.3 pounds of 40 percent gelatin powder per linear foot.

DRAGLINE EXCAVATOR ON PADS

For the digging of 510 miles of canals and laterals in the Worth Drainage district, Florida, there are used three Bucyrus Class 9½ steam operated caterpillar mounted dragline excavtors with 45-foot booms and 1½-yard buckets. These heavy machines are successfully moved over soft and swampy ground by the use of 6 x 34-foot pads, 9 inches thick, made of crossed layers of 3x10-inch planks. Bridles at both ends of each pad are hooked to the loading chains on the buckets and the pads are swung in position in front of the machine and dragged forward by the dragline as the machine advances. They are carried on logging carts hauled by the tractor for longer distances.

TRACTOR WORKING IN CLAY WITH A SNAP BAR ABOUT FIVE YARDS LONG

HIGHWAY BUILDING WITH REVERSIBLE TRAILERS

Highway construction in Arizona includes the use by the Pinal County Highway Commission at Florence, of seven 4-wheel 2½-ton reversible highway trailers, equipped with two ½-yard bottom dump spreader type bodies for handling road surfacing material from the storage bins to the required position.

Ordinarily they are hauled with ease by 2-ton trucks, but in some cases they are handled by a 75 h. p. Holt tractor, which is shown in the accompanying engraving as it was used to successfully handle the entire fleet of 7 trailers. A letter from W. W. Lane, Highway Engineer, states that the trailers have been found "entirely satisfactory in every way."

PERSONALS

Maier, Harry L., formerly engineer in charge of sewers, Street and Sewer Department, Wilmington, Del., has been appointed chief engineer to succeed Edgar M. Hoopes.

Barlow, J. E., formerly city manager of New London, Conn.

Powell, Trevor J., of Summit, N. J., has been appointed assistant county engineer of Union County, N. J.

Theriault, Adolph D., has been appointed superintendent of the Pennichuck Water Works, Nashua, N. H., to succeed William F. Sullivan.

Hicks, C. P., of Centralia, Wash., has been employed by the city council of Pe Ell, Wash., as engineer in charge of construction.

Sperr, Ray, county engineer of Keweenaw County, Mich., has resigned to accept a position with the Wisconsin State Highway Department.

Harsh, Robert S., of Alliance, Ohio, has been appointed state architect and engineer of Ohio and will be connected with the department of highways and public works.

Blunden, J. Paul, formerly county engineer of Boone County, W. Va., has been appointed assistant division engineer, West Virginia State Road Commission. Headquarters at Martinsburg.

NEWS OF THE SOCIETIES

(Continued from Page 422)

GOOD ROADS CONGRESS AND SHOW

The Twelfth American Good Roads Congress and Thirteenth National Good Roads Show to be held at the Coliseum in Chicago, January 17 to 20, is extending special invitations to women fully realizing that they are voters, tax payers and road users and when once interested in a patriotic movement are indefatigable in its behalf.

Numerous demonstration tests of road building machinery will be included in the exhibits at the show, with the machinery in actual operation. Reservations of exhibition space have broken all records, the entire lower floor of the Coliseum and Annex have already been engaged, necessitating the leasing of adjoining buildings in order to house overflow. The exposition will be the largest of its kind the world has seen.

Eight sessions of the Congress will be held. It is expected that at least 20,000 delegates will attend. One session will be devoted to a discussion of comparative designs in road pavements, another will be devoted to a discussion of the problems involved in highway traffic, especially truck transportation, safety on the roads and future laws and regulations governing highway transport. A third session will be devoted to taxation, bond issues and problems of highway administration and finance.

The Portland Cement Association, Chicago, Ill., the Asphalt Association, New York, the National Association of Paving Brick Manufacturers, Cleveland, Ohio, and other organizations of road material producers are cooperating in the arrangements for the Congress. One session, to be held under the auspices of the Portland Cement Association, will be devoted exclusively to a discussion of proper methods in building the various types of concrete roads. Another session, for which the program will be prepared by the Asphalt Association, will be devoted entirely to the construction of asphalt and other bituminous types of streets and roads, and a third will feature brick and other types of pavement. One session will be devoted exclusively to a discussion of the latest methods evolved in the construction of the common types of roads such as gravel, macadam and earth.

ATLANTIC DEEPER WATERWAYS ASSOCIATION

At the convention in Savannah, Nov. 18th, J. Hampton Moore, mayor of Philadelphia, was reelected president; Wilfred H. Schoff, of Philadelphia, secretary-treasurer; and Durrell Schuster, of Philadelphia, assistant secretary; George T. Leach was elected vice-president for North Carolina.

In the report of the committee on resolutions, which was adopted by the convention, the following resolution was embodied:

"The continued agitation for the canalization of the St. Lawrence river prompts us to reiterate our earnest belief in the principal declared at our convention in 1920, that all appropriations made by the congress of the United States for the improvement of waterways should be expended solely upon such improvements as lie wholly within American boundaries, jurisdiction and control."

Southern delegates expressed considerable dissatisfaction over this resolution and prophesized that it would have the effect of antagonizing the whole west and southwest, with result that appropriations for intercoastal waterways would be held up.

The southern delegates were defeated in an effort to have the resolutions committee embody in its report a resolution asking congress to appropriate $14,000,000 for the construction of the Inter-coastal waterway from Beaufort to Jacksonville, Florida. The remainder of the resolutions committee report simply reaffirms the resolution approved last year at Atlantic City and asks only that congress adopt the inter-coastal waterway from Beaufort to Jacksonville.

OHIO VALLEY IMPROVEMENT ASSOCIATION

At the Pittsburgh convention, Nov. 17th, members and guests attended opening ceremonies of Boeline Dam, 14 miles below Evansville, which is the 35th of a total of 44 having an estimated total cost of $81,000,000.

The officers reelected were: President Oscar F. Barrett, Secretary W. C. Cutkins, Treasurer George Puchta, all of Cincinnati. Among the vice-presidents chosen were: William B. Rodgers, J. Frank Tilley and Thomas E. Doyle, all of Pittsburgh. The convention passed a resolution asking for the appropriation of $20,000,000 within the next five years to complete the improvement of the Ohio River from Pittsburgh to Cairo.

After the adjournment of the convention a conference was held and approved the calling of a general conference of all waterways organizations to be held at Washington late in January.